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ABSTRACT

A study assessed the validity of the hypothesis that offshore drilling personnel would independently study important material if they knew that they would eventually receive formal training on the topic covered in the material. Eighty-one crew members on an offshore drilling rig were randomly divided into experimental and control groups. Those in the experimental group were given safety training manuals when assigned to the rig and were informed that they would eventually receive safety training. The members of the control group were not given copies of the manual that would eventually be used in the training. After a two-month waiting period, both groups were given safety training. Data from a training program pretest indicated that there were no significant differences in the mean ages or grade levels of the members of each group. There was, however, a significant difference in the mean pretest scores of the two groups. The control group mean score was 23.30952, whereas that of the experimental group was 30.5, which indicated that the practice of providing training manuals before providing scheduled training programs has measurable benefits and should thus be adopted. (MN)

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A COMPARISON OF PRE TEST MEANS FROM OIL FIELD
WORKERS HAVING AVAILABLE MANUALS AND
THOSE LACKING MANUALS BEFORE
ANNOUNCED TRAINING

Learning Theories and Applications

by

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A Practicum presented to Nova University in Partial
fulfillment of the requirements for the
degree of Doctor of Education

Nova

June 6, 1987

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ABSTRACT

The purpose of this practicum was to confirm or contradict the applicability of a learning principle, to the situation offshore. The learning principle was that offshore personnel will independently study important material. The basic problem was to determine whether or not the provision of manuals coupled with the announcement of eventual training resulted in an increase of the personnel's knowledge of safety, before these employees received formal training. The research hypothesis stated that the mean of the pre test scores of the late crews (experimental group) was greater than the mean of the pre test score of the early crews (control group). Only the early crews lacked manuals before their formal training.

This observational study included only the scores from the personnel of Diamond M Company. Each contributing employee was an adult male. A two tailed z-test ($\alpha=.05$) Was used to test the hypothesis of similarity between the control (early crew members) and the experimental (late crew members) groups with respect to

age and then with respect to educational level. Both groups were similar in these important respects. A z-test compared the means of the pre test of the two groups. The null hypothesis was rejected at the five percent level of significance; it had stated that there was no difference between the pre test mean of the control group and the pre test mean of the control group.

Manuals for future courses should be sent to the offshore installations as soon as the manuals are prepared. Quarterly independent reviews guided by questions from the training department are recommended. Furthermore, a study of the results of these quarterly assignments is recommended. The training department of Diamond M Company should also investigate the usefulness of various means to convey information other than manuals.

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INTRODUCTION

The purpose of this practicum was to confirm or contradict the applicability of a learning principle to the situation offshore. The learning principle was that offshore personnel will independently study important material. The acceptance or rejection of this principle for offshore personnel will affect the future educational strategy of the training department of Diamond M Company. In the offshore situation, independent study could convey information to offshore personnel quicker than conventional training. Comparing the pre test means of employees, who received study material before training, to the pre test means of employees, who lacked the study material before being trained, helped the training department evaluate the applicability of independent study. Independent study was seen as a way to reduce the time taken to convey a glut of facts.

As the result of several grisly, oilfield related marine casualties, several institutions had appreciated the value of many formerly overlooked topics of safety. The International Association of Drilling Contractors had submitted its Task Force Analysis (Marine Task Analysis

Review Committee, 1984), regarding the training to be required of offshore supervisors, to the United States Coast Guard. This analysis described the training which the association agreed the United States Department of Interior should require by regulation. This analysis listed 114 topics of then unaddressed formal training.

In its undated Notice of Proposed Rulemaking, issued in 1985, the United States Coast Guard wrote

... the training and qualifications contained in the proposal, which are strongly recommended by the National Transportation Safety Board generally supported by industry and under serious consideration internationally, will certainly be justified if they contribute to the prevention of the loss of even one MODU and its crew, or even minimize the down time of an operational unit.

(MODU meant mobile offshore drilling unit, or, as used in this study, installation.) In a similar vein, the American Petroleum Institute called for the timely development of expanded training (Christman, 1985).

Several institutions had recently appreciated the value of many formerly overlooked topics of safety. Conveying this information to offshore personnel one crew at a time would take too much time, perhaps eleven years. Some theories of adult learning led the training department to predict that offshore personnel might independently study and thus learn safety information while still on their offshore locations. Comparing the pre test scores of

employees, who had study material available to them, with the pre test scores of employees, who lacked the study material, was a way to help the training department evaluate the applicability of independent study in the offshore environment.

The basic problem was to determine whether or not the provision of manuals coupled with the announcement of eventual training resulted in an increase of the personnel's knowledge of safety, before these employees received formal training. This practicum amounted to an observational study to test the null hypothesis: There was no significant ($<.05$) difference between the pre test mean of those who have manuals and the pre test mean of those who lack the manuals before arriving for formal training. The records of the classes were available. A solvable problem and an answerable research question thereby developed.

STATEMENT OF THE PROBLEM

The basic problem was to determine whether or not the provision of manuals coupled with the announcement of eventual training resulted in an increase of the personnel's knowledge of safety, before these employees received formal training. The research question was: did the provision of manuals coupled with the announcement of

eventual training result in the increase of the personnel's knowledge of safety before they received formal training?

RESEARCH HYPOTHESIS

The research hypothesis stated that the mean of the pre test scores of those having manuals before training was greater than the mean of the pre test scores of those lacking the manuals before training. Of course, this implied the assumption of some relationship between study and achievement. From this hypothesis, the null hypothesis could easily develop.

BACKGROUND AND SIGNIFICANCE

The basic problem was to determine whether or not the provision of manuals coupled with the announcement of eventual training resulted in an increase of the personnel's knowledge of safety, before these employees received formal training. The purpose of this practicum was to confirm or contradict the applicability of a learning principle, in the situation offshore. The learning principle was that offshore personnel will independently study important material. This learning principle was shared by several learning theories.

The application of learning theories to educational efforts was an objective of the seminar entitled learning

theories and applications (Losak, 1981). The conjecture, that the provision of study material along with the announcement of eventual formal training would lead to independent study, was induced primarily by cognitive evaluation theory and its related theories of learning. It was also induced by the similarity of the preinstructional situation offshore to either of two behavioral learning schemas. Consequently, this study was an examination of the applicability of learning theories.

The purpose of this practicum was to confirm or contradict the applicability of a learning principle in the situation offshore. The learning principle was that offshore personnel will independently study important material. The acceptance or rejection of this principle for offshore personnel will affect the future educational strategy of the training department. Rapid education was important. Diamond M Company's offshore personnel needed to receive newly appreciated information about safety quicker than they then did. They needed to learn much new information, and the conventional conveyance of information was slow. An example illustrated the situation.

The International Association of Drilling Contractors had submitted its Task Force Analysis (Maritime Analysis Review Committee, 1984), regarding the training to be required of offshore supervisors, to the United States

Coast Guard. This analysis described the training which the association agreed the United States Department of Interior should require by regulation. This analysis listed 114 topics of then inadequately addressed formal training.

Ten of these topics were incorporated into a new course, and the conveyance of this course to all the offshore employees of Diamond M Company required one year (Zambon, 1986). The formal conveyance of the information in the remaining topics was calculated to take approximately eleven years. Yet, this training was urgently needed. These topics addressed important needs of offshore personnel. The Coast Guard Summarized the situation.

In its undated Notice of Proposed Rulemaking, issued in 1985, the United States Coast Guard wrote

... the training and qualifications contained in the proposal, which are strongly recommended by the National Transportation Safety Board generally supported by industry and under serious consideration internationally, will certainly be justified if they contribute to the prevention of the loss of even one MODU and its crew, or even minimize the down time of an operational unit.

(MODU meant mobile offshore drilling unit, or, as used in this study, installation.) In a similar vein, the American Petroleum Institute called for the timely development of expanded training (Christman, 1985).

All Offshore drilling companies had to provide their offshore employees much new information about safety. A technique to convey safety information in a short time could reduce the exposure of 1. the offshore personnel to catastrophes, 2. the company to the loss of extremely valuable capital equipment, and 3. the company's sales effort to innovative competitors. Through a quickened educational effort, the employees could safeguard their health, the company could protect its capital assets, and the competitiveness of the company could improve. Time was critical, though.

At the time, the training department of Diamond M Company required one year to convey the information of a course to all the company's offshore personnel, an excessive length of time. If a speedy way to convey information to offshore employees had been available, then management should have been advised about it.

A search of the Educational Resources Information Center data base and the American Psychological Association data base produced no reference bearing on this problem. Nevertheless, both the cognitive evaluation theory, along with the learning theories related to it, and the behavioral approach to explaining learning led the training department to predict that some prospective trainees would independently study the information of an approaching

course on safety, ahead of time. The training department drew its conclusions from the following arguments.

Learning was directly related to the period of studying (Levin and Long, 1981). The motivation of individuals to learn was of primary importance to learning. Where there was no motivation, there was no learning (Walberg and Uguroglu, 1980). Motivation caused the attempt to learn, it mediated learning, and it was a consequence of learning (Wlodkowski, 1985).

An assumption of cognitive evaluative theory (Wlodkowski, 1985:284) was

People will propel themselves to greater achievement out of their interests and desires for mastery. Environments and approaches that allow this are active education and its learning, active learning. People will be active in their learning if the situation allows and supports it. People are innately motivated to be effective in dealing with their environments and to master new situations.

Cognitive evaluation theory was a theory of adult motivation to learn, which corresponded to and supported the basic assumptions of Knowle's androgogy (Wlodkowski, 1985:238).

Although androgogy was a controversial theory, its generalization that the adult was a practical learner was

widely accepted (Wlodkowski, 1985:6). Wlodkowski (1985:6) wrote

Research consistently shows that vocational or practical education that leads to knowledge about how to do something is chosen by more adults than any other form of learning. Adults have a strong need to apply what they have learned and to be competent in that application...Knowles...believes that the deepest human need is for self esteem. It can be generalized, therefore, that adults by definition, learning theory, and social research are responsible people who seek to build their self-esteem through pragmatic learning activities in which their competence is enhanced.

Knox (1986) cited occupational concerns as developmental tasks that determined the subjects which middle class men pursued during their productive years. Brundage and Mac Keracher (1980) wrote that adults were highly motivated to learn in areas related to their current developmental tasks.

Nevertheless, in all this related literature, the role of past experience admittedly affected the motivation to learn. Wlodkowski (1985:9) wrote, "The two most commonly found barriers in this area relate to age and educational background." Brundage and Mac Keracher (1980) also cited the learner's past experience as a helpful resource or as a potential hindrance to his current learning.

The behaviorists did not see the educational history of the individual as just a factor in his learning; they

saw it as the factor. They did break down experience into schedules of reinforcement, however. The founder of androgogy, Knowles, raised the issues of reward and punishment. Knowles (1975:21) wrote

Teacher directed learning assumes that students are motivated to learn in response to external rewards and punishments...whereas self-directed learning assumes that learners are motivated by internal incentives such as the need for esteem (especially self-esteem), the desire to achieve, the urge to grow, the satisfaction of accomplishments, the need to know something specific, and curiosity.

The explanations of the effects of the learner's educational experiences and of his previous experience with rewards and punishments placed the cognitive evaluation theory into a loose opposition to the behavioral approach to explaining learning. Nevertheless, this opposition was irrelevant in this study. Even the behavioral approach to explaining learning allowed the prediction that individuals who are faced with eventual training will independently study available material. This conclusion was drawn for the following reasons.

Behaviorally, Atkinson, Atkinson, Smith, and Hilgard (1985:219) defined learning as a "relatively permanent change in behavior as a result of practice." They further stated

When a conditioned response has been associated with a particular stimulus, other similar stimuli will evoke the same response.

This generalization will occur, they continue, "...although generalization may be curbed by discrimination training." Their main point was that subjects, once conditioned according to one schema, later acted as conditioned in a similar schema. This was what learning is all about.

This practicum considered only individuals who had an educational history. Consequently, each of these individuals probably viewed his eventual training as either a reward or as an aversive stimulus. He might have, therefore, responded to the generalized stimulus of further training in any of only four ways. 1. He might have tried to approach the reward. 2. He might have tried to avoid the reward. 3. He might have tried to approach the aversive stimulus. 4. He might have tried to avoid the aversive stimulus. (The best explanation of avoidance learning involved escape conditioning, so a further outcome did not need listing (Atkinson, Atkinson, Smith, and Hilgard, 1985).) On the one hand, the approach to a reward and the avoidance of an aversive stimulus implied that the prospective trainee would study ahead of time (Domjan and Burkhard, 1982). On the other hand, the avoidance of a reward and the approach toward an aversive stimulus implied that the trainee would not study. These last two behaviors corresponded to uncommon behaviors. The scarcity of the kinds of students, who behaved like this, might have been inferred from the preoccupation of learning theories with

the students who approached a reward or who avoided an aversive stimulus. Nevertheless, the avoiders of study are mentioned in some literature. Good and Brophy (1986) cited the "alienated student" as one of Good's and Power's (1976) five types of student. This type was a reluctant learner.

Those prospective trainees who were later trained in offshore survival systems had experiences with schooling. Their early schooling could have trained them to study to gain a reward, or to avoid unpleasantness, or to avoid study at all costs. They learned some behavior that was a response to the stimulus of a demand that they learn something new. Learning to gain a reward was called operant conditioning. Learning to avoid unpleasantness was called avoidance learning. As adults, some prospective trainees might have viewed the lack of safety knowledge or the lack of a passing grade as an "aversive stimulus," to be removed through study. Their acquisition of this knowledge should have acted as a "negative reinforcer." For them, studying was the repetition of an already learned "avoidance behavior," avoidance of an aversive situation.

Other prospective trainees might have viewed the acquisition of safety information or the attainment of a good grade exclusively as a "reward" to be pursued through study. Those trainees who had been conditioned not to study constituted an unknown portion of the offshore personnel. As a group, these individuals were expected to

have dropped out of formal schooling earlier than those who had been conditioned to study. Consequently, whether the employees viewed their situation with apprehension or eagerness, learning theory predicted that some would independently study and consequently learn. Whether they would or not was not obvious.

Cognitive evaluative theory and its related theories allowed the prediction that offshore personnel would try to study the practical, environmentally related manuals set aboard their installation. The behavioral approach to explaining learning allowed the prediction that the manuals and the announcement of formal training would elicit studying from some offshore personnel. This prediction was weakened by the possibly mitigating effects of the personnel's experiences, environments, and other variables. Knox (1986) cited anxiety and fear of failure as factors discouraging learning. The list could be longer. These factors, that mitigated learning, might have acted weakly or powerfully; these factors might have allowed learning or not. Whether or not the provision of the manuals for a prospective course and the announcement of the eventual training elicited successful study from prospective trainees was decided by an observational study.

DEFINITIONS

The following terms were operational definitions for this study.

1. The employees who worked on offshore drilling units were called offshore personnel.
2. A group of personnel scheduled to work together was a crew; these crews worked on an installation far from shore.
3. An early crew was a crew that lacked access to the manuals of the formal course, before they arrived for formal training.
4. A late crew was a crew that had access to the manuals of the formal course, before they arrived for training. The installation on which crews worked was an offshore installation.
5. More specifically, an offshore installation as used in this practicum was a mobile offshore drilling unit.

Some of the psychological jargon might not seem familiar either.

6. Androgogy was a theory of adult learning. Independent study meant an attempt to learn by any means excluding the use of a formal "school house" or a formal instructor.

7. A reinforcing stimulus was a stimulus that increased the probability of a chosen response, an operant.
8. A reward was a reinforcing stimulus.
9. A negative reinforcer was a stimulus whose cessation increased the likelihood of a chosen response occurring.
10. Finally, an aversive stimulus was an unpleasant or noxious stimulus.

LIMITATIONS

The individuals who contributed scores for this study were drawn from the employees of an offshore drilling company. Their scores were to be used to calculate the means used in this study.

1. Consequently, the results would be applicable to the offshore personnel of only this one company.
2. Additionally, only one instructor administered the pre tests to the trainees.
3. Presumably, the passage of time did not affect the actions of the administrator or of his subjects during the administration of the pre tests.
4. It is also important that no member of the training department had asked a prospective trainee to study before the trainee's attendance of formal training.
5. Lastly, this study placed only reading material on the installations.

This study was observational because of the impracticality and expense of performing a controlled experiment. Intervening variables might have encouraged or discouraged the students' study.

6. Some variables remained uncontrolled. Yet, discovering whether or not these variables extirpated studying behavior was important. The training department needed to know whether or not learning would occur despite the effects of the intervening variables, that is, despite the situation aboard the installations.

ASSUMPTIONS

This study assumes that the subjects had been randomly assigned to each group although randomization had not been assured; that both groups were homogeneous; that physical problems affected both groups similarly; that those selected represented the population of the company; that the intact groups were randomly assigned to the control and the experimental groups: that members of the experimental group had an opportunity to read the manuals for their prospective course; that members of the control group had no opportunity to read the manuals for their prospective course; that any studying occurred at the installation; that the instructors provided the same directions and time to everyone who completed his pre test; that the behavioral approach to explaining learning is an

appropriate model to use; that the cognitive evaluation theory is appropriate; that the previous educational history of each trainee induced him to perceive prospective training as either a reward or as an aversive stimulus; and that individuals who had discouraging educational experiences dropped out of school earlier than those who were not discouraged.

PROCEDURES FOR COLLECTING THE DATA

The problem was to determine whether or not the provisions of manuals along with the announcement of eventual training resulted in an increase of the personnel's knowledge of safety, before they were trained. Offshore personnel needed to receive newly appreciated information about safety quicker than they did. One of the many ways to educate distant personnel was independent study. Did the provision of manuals coupled with the announcement of eventual training result in the increase of the personnel's knowledge of safety, before they received formal training? The best estimate of the training department was that it did. It expected that the mean of the pre tests of the late crews would be greater than the mean of the pre tests of the early crews. The corresponding null hypothesis stated: There was no significant ($\alpha=.05$) difference between the pre test means

of the personnel having manuals before training and the pre test means of the personnel lacking manuals before training.

An early crew is a crew that lacked access to the manuals of the course to study before attending the course. A late crew is a crew that had access the manuals before attending the course. The pre test scores of every crew is on file at the Training Center of Diamond M Company. This information is already sorted by installation and dates of attendance. Beside the name of each participant is written his position, his date of birth, his last grade completed, and his post test score. The control group consisted of members of the early crews. The experimental group consisted of members of the late crews.

The members of the late crews outnumbered the early crews by a factor of four. Members of early and late crews for each rig were assigned to the control and experimental groups respectively only if their dates of attendance were separated by at least two months of time. Otherwise these members were discarded. A collection of individuals equal to the number in the early crews was chosen from the late crews to serve as the experimental group. Those chosen were the first trainees to attend the course after the waiting period of two months had passed. This was a feasible method of collecting data, resulting in forty-one pre test scores for the control group and 41 pre test

scores for the experimental group. The use of such data for an observational study is described in Research in Education (1986). It was also recommended by Foy (1978), and it is displayed by Triola, (1983). This change from the proposal was agreed upon by Dr. Rigg (May 29, 1987).

PROCEDURES FOR TREATING THE DATA

The null hypothesis stated that there was no significant ($\alpha=.05$) difference between the pre test means of the personnel having manuals before training and the pre test means of the personnel lacking manuals before training. The alternative hypothesis stated that the means of the two groups were significantly different. The independent variable was the availability of appropriate study materials to the personnel aboard offshore installations. The dependent variable was the pre test scores of the personnel from offshore locations.

To determine whether or not statistical control for age had to occur, a two tailed z-test compared the means of the ages for the control and for the experimental groups. To determine whether or not statistical control for educational level had to occur, a two tailed z-test compared the means of the educational levels for the control and for the experimental groups. Each z-test used a five percent level of significance. If one or two

significant differences had appeared, then analysis of covariance could have tested the null hypothesis while controlling for age or grade level (Foy, 1987). Wilde and Ahtoli (1978) recommended analysis of covariance to remove bias in observational settings. Again the related level of significance was to have been five percent. If no significant differences in the mean of ages or of educational level had occurred, the procedure was to have been the use of a two tailed z-test to compare the means of the pre tests. No significant difference in the means of the ages or in the means of the grade levels appeared. Consequently, a two tailed, z-test determined whether the means of the pre tests were different at the five percent level of significance. This kind of z-test was recommended for the data as collected in this experiment by Best and Khan in Research in Education (1986), Triola (1983), and Foy (1987).

PRESENTATION OF THE RESULTS

Forty-one individuals constituted the control group. and forty-one individuals constituted the experimental group. Included were supervisors (superintendents, toolpushers, drillers, crane operators, captains) and non supervisors (roustabouts, roughnecks, galleyhands). The data were presented in the appendix . These personnel

were collected from five of the company's offshore installations. Tables one and two show the means, variances, and count of the ages, educational levels, and pre test scores that were contributed by the control and experimental groups. A detailed breakdown of the data may be found in the appendix. The displayed mean pre test score is the number correct out of fifty-two questions.

TABLE 1

Means, Variances, and Count of the Ages, Educational Levels, and Pre Test Scores Contributed by the Control Group

	AGE IN DAYS	EDUCATIONAL LEVEL	PRE TEST
Mean	12745.780	11.341	23.878
Variance	13580344.903	4.028	63.034
N	41	41	41

TABLE 2

Means, Variances, and Count of the Ages, Educational Levels, and Pre Test Scores Contributed by the Experimental Group

	AGE IN DAYS	EDUCATIONAL LEVEL	PRE TEST
Mean	12361.659	11.710	31.244
Variance	14485061.151	2.500	109.404
N	41	41	41

A two tailed z-test compared the means of the ages of the control and the experimental groups. This calculation yielded a value of .4643. A similar z-test also compared the means of the formal educational levels of both groups. This calculation yielded -.9143. Yet, to reject the similarity of the two means using a two tailed z-test at a five percent level of significance the calculated value

should have been at least 1.96 (Summers, Peters, and Armstrong, 1977). These values led to the failure to reject the null hypothesis that these groups had the same mean ages and mean educational levels.

The control and experimental groups had similar mean ages and formal educational levels. Consequently, the comparison of the pre test means of the experimental group and the control group did not require statistical control of age or formal educational level. The mean of the pre test scores of the control group was 23.30952, and the mean of the pre test scores of the experimental group was 30.5. A two tailed z-test compared the pre test means of the experimental group and of the control group. The calculated value for this comparison was 3.5918. The null hypothesis had stated that there was no significant ($\alpha = .05$) difference between the pre test means of the personnel having manuals before training and the pre test means of the personnel lacking manuals before training. The null hypothesis was rejected at the five percent level of significance ($p < .01$). This conclusion led to the acceptance of the alternative hypothesis. The mean of the late crews was significantly greater than the mean of the early crews. The data supporting this conclusion was displayed in the appendix.

DISCUSSION AND IMPLICATION OF THE RESULTS

The basic problem was to determine whether or not the provision of manuals coupled with the announcement of eventual training resulted in an increase of the personnel's knowledge of safety, before these employees received formal training. The research hypothesis stated that the mean of the pre test scores of the late crews would be greater than the mean of the pre test scores of the early crews. The purpose of this research was to confirm or contradict the applicability of a learning principle: that offshore personnel would independently study important material.

The study took equal numbers from the early crews and the from the late crews. Only the late crews had access to manuals of a course in which they would later be trained. A two tailed z-test demonstrated no significant difference between the control and the experimental groups with regard to age or educational level. Consequently, statistical control of age and educational level did not need to occur in the test of the null hypothesis involving the pre test means. This null hypothesis said that there was no

significant ($\alpha = .05$) difference between the pre test means of the personnel having manuals before training and the pre test means of the personnel lacking manuals before training.

A two tailed, z-test lead to the rejection of the null hypothesis at the five percent level of significance. The late crews earned a greater mean than did the early crews. The late crews, the experimental group, earned a mean that was seven points greater than the mean of the control group. The provision of manuals coupled with the announcement of eventual, formal training resulted in an increase in the personnel's knowledge of training, before they received formal training.

The greater mean of the experimental group implied that offshore personnel took the opportunity to study the manuals when the manuals were available to them. Consequently, the training department speculated that the early provision of manuals together with the announcement of training might result in a quick increase in the personnel's knowledge of safety long before they had to go to formal training. The increase was expected to occur within a month or two. The increase in knowledge could occur in many courses, so long as the manuals were provided. The training department should quickly provide offshore personnel with manuals for the new courses it develops.

Study into the best means to provide the information to offshore personnel needed to occur to try to increase the pre test scores even higher than they were raised. In any case, the harmony between the results of this observational study and the literature allows financially moderate recommendations.

RECOMMENDATIONS

The provision of manuals coupled with the announcement of eventual training resulted in an increase in the knowledge of safety of offshore employees. This contingency should undergo further testing in the form of a well controlled experiment. Nevertheless, the harmony between the results of this observational study and the literature allows financially moderate recommendations.

Manuals for future courses should be sent to the offshore installations as soon as the manuals are prepared. The quick provision of manuals should produce a quick increase in the knowledge of offshore personnel. This expected quick increase in knowledge is a valuable end in itself.

The training department of Diamond M Company should investigate the usefulness of various means to convey

information other than manuals. Perhaps videotapes, or some such means to convey information, corresponding to each manual could produce even greater improvement in the personnel's knowledge of safety.

A similar observational study involving other courses should occur to determine the general effectiveness of this method of increasing the offshore personnel's knowledge. Manuals for future courses should be sent to most of the offshore installations as soon as the manuals are prepared. The trainees' pre test scores should reveal whether or not the personnel with manuals had used them. The increase in knowledge of the offshore personnel could be assessed by comparing the pre test scores of these personnel against the pre test scores of personnel who had been purposely deprived of manuals before their testing. The demonstration of the rapid conveyance of information for different kinds of courses would provide further confirmation of the instructional efficiency of this kind of independent study.

Furthermore, the training department of Diamond M Company should produce regularly spaced assignments for the offshore personnel to complete. These assignments should review the material that some repetitive in-house course will teach, as well as material that some non repetitive

course will teach. These assignments can be delivered to the installations by the supervisors. The supervisors can collect the assignments from the training center when they pass by the main office before they leave for their installations. Then, they can return the completed assignments to the training center on their next tour of duty. Such a procedure has a probability of maintaining the knowledge of offshore personnel. Additionally, such a study can provide insight into the influence of the announcement of eventual training on the personnel's achievement offshore. Whether or not the regular assignments corresponding to the repetitive courses earn greater means than the assignments for a completed one session course can reveal the influence of the "announcement of formal training" on independent learning. Consequently, quarterly independent reviews guided by questions from the training department are recommended. A study of the results of these quarterly assignments is recommended.

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APPENDIX
RAW DATA

TABLE 3

Name Codes, Ages, Educational Levels, and Pre Test
Scores Contributed by the
Control Group

NAME	POSITION	AGE IN DAYS	EDUCATIONAL LEVEL	PRE TEST
A	GALLEYHAND	10407	14	32
B	FLOORHAND	10767	11	10
C	TOOLPUSHER	22146	12	23
D	FLOORHAND	10880	12	48
E	ROUSTABOUT	8219	12	15
F	DRILLER	11598	12	49
G	ROUSTABOUT	16275	8	21
H	ROUSTABOUT	11601	12	21
I	CRANE OPERATOR	13507	9	21
J	CONTROL ROOM OP.	21152	5	13
K	ROUSTABOUT	10442	10	11
L	BARGE CAPTAIN	19571	11	26
M	MOTORMAN	10659	15	27
N	MECHANIC	11080	10	25
O	ROUSTABOUT	12695	8	23
P	ROUSTABOUT	8804	12	24
Q	FLOORHAND	9627	10	20
R	ROUSTABOUT	7906	12	24
S	TOOLPUSHER	17118	12	22
T	WELDER	13572	12	27
U	FLOORHAND	12800	12	25
V	DERRICKHAND	11346	12	17
W	FLOORHAND	9672	12	25
X	ROUSTABOUT	9797	12	23
Y	ELECTRICIAN	17600	12	27
Z	DRILLER	18497	12	25
A1	MOTORMAN	18446	12	19
B1	ROUSTABOUT	14168	14	32
C1	ROUSTABOUT	13682	13	25
D1	TOOLPUSHER	11741	12	22
E1	DRILLER	9476	13	27
F1	CONTROL ROOM OP	10029	12	32
G1	DERRICKMAN	9006	12	24
H1	CRANE OPERATOR	16810	12	25
I1	FLOORHAND	13843	12	22
J1	FLOORHAND	8342	9	25
K1	ROUSTABOUT	11373	12	22

TABLE 3 (continued)

Name Codes, Ages, Educational Levels, and Pre Test
Scores Contributed by the
Control Group

NAME	POSITION	AGE IN DAYS	EDUCATIONAL LEVEL	PRE TEST
L1	FLOORHAND	8609	12	18
M1	DERRICKHAND	16687	5	23
N1	FLOORHAND	10939	11	6
O1	ELECTRICIAN	11688	13	33

TABLE 4

Name Codes, Positions, Ages, Educational Levels, and
Pre Test Scores Contributed by the
Experimental Group

NAME	POSITION	AGE IN DAYS	EDUCATIONAL LEVEL	PRE TEST
AA	GALLEYHAND	8145	14	27
AB	FLOORHAND	10063	12	48
AC	TOOLPUSHER	19844	10	39
AD	FLOORHAND	9941	8	41
AE	ROUSTABOUT	8247	12	48
AF	DRILLER	9496	12	48
AG	ROUSTABOUT	16800	8	15
AH	ROUSTABOUT	8670	12	18
AI	CRANE OPERATOR	14473	12	27
AJ	CONTROL ROOM OP	13911	15	34
AK	ROUSTABOUT	11226	10	25
AL	BARGE CAPTAIN	18503	12	43
AM	MOTORMAN	11367	12	29
AN	MECHANIC	22317	10	22

TABLE 4 (Continued)

Name Codes, Positions, Ages, Educational Levels, and
Pre Test Scores Contributed by the
Experimental Group

NAME	POSITION	AGE IN DAYS	EDUCATIONAL LEVEL	PRE TEST
AE	ROUSTABOUT	15553	9	10
AO	ROUSTABOUT	7858	12	24
AP	FLOORHAND	9185	10	40
AQ	ROUSTABOUT	9091	12	26
AR	TOOLPUSHER	15395	12	44
AS	WELDER	17893	11	44
AT	FLOORHAND	10791	12	44
AU	DERRICKMAN	9208	12	29
AV	FLOORHAND	11653	12	34
AW	ROUSTABOUT	13489	12	36
AX	ELECTRICIAN	12806	11	42
AY	DRILLER	16033	12	40
AZ	MOTORMAN	20683	12	32
AA1	ROUSTABOUT	10826	11	12
AA2	ROUSTABOUT	8611	14	19
AA3	TOOLPUSHER	16126	12	33
AA4	DRILLER	10272	16	29
AA5	CONTROL ROOM OP	13905	9	16
AA6	DERRICKMAN	10680	12	40
AA7	CRANE OPERATOR	10287	12	25
AA8	FLOORHAND	9121	12	30
AA9	FLOORHAND	10712	14	25
AA10	ROUSTABOUT	7748	12	26
AA11	FLOORHAND	12482	12	28
AA12	DERRICKMAN	8365	12	45
AA13	FLOORHAND	9258	12	29
AA14	ELECTRICIAN	15794	12	15